TELE-PATH INDUSTRIES
DDS TEST UNIT
MODEL 82
OPERATING MANUAL

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TELE-PATH INDUSTRIES
DDS TEST UNIT
MODEL 82
OPERATING MANUAL

TELE-PATH INDUSTRIES, INC.
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TABLE OF CONTENTS

CONTENTS	PAGE
SECTION I - INTRODUCTION	
1.1 GENERAL INFORMATION	1-1
1.1.1 DIGITAL NETWORK	1-2
1.1.2 LOCAL LOOP	1-4
1.1.3 DATA SERVICE UNIT	1-7
1.1.4 CHANNEL SERVICE UNIT	1-8
1.1.5 OFFICE CHANNEL UNIT	1-9
1.1.6 SECONDARY CHANNEL	1-11
1.1.7 DSOB SIGNALS	1-13
1.1.8 DS-1	1-15
1.1.9 OCUDP	1-16
1.1.10 56 Kb/s REPEATER	1-18
1.2 PHYSICAL DESCRIPTION	1-20
1.2.1 EXTERNAL CONNECTIONS	1-21
1.2.2 CONTROLS AND INDICATORS	1-22
1.2.3 TEST PATTERNS	1-43
1.2.4 CABLES AND ACCESSORIES	1-44

1.3 FUNCTIONAL DESCRIPTION 1-46
1.3.1 APPLICATION 1-46
1.3.2 MAINTENANCE 1-48
1.4 BATTERY REPLACEMENT 1-49
1.5 SPECIFICATIONS 1-50

SECTION II - USING THE DDS TEST UNIT

2.1 POWER UP 2-1
2.2 TEST INFORMATION 2-2
2.2.1 DDS TEST UNIT SET-UP 2-3
2.2.2 TEST ACCESS 2-4
2.2.3 TYPES OF TESTS 2-5
2.3 TYPICAL APPLICATIONS 2-7
2.3.1 LOOPBACK TO NETWORK 2-7
2.3.2 STRAIGHTAWAY, LOCAL LOOP 2-10
2.3.3 LOOPBACK TO LOCAL LOOP . 2-16
2.3.4 END TO END, NETWORK 2-20
2.3.5 END TO END, 4 WIRE LOOP . . 2-23
2.4 TROUBLESHOOTING 2-25

SECTION III - SWITCHED 56 OPTION

3.1 GENERAL DESCRIPTION 3-1

3.2 OPERATION 3-2

SECTION IV - METALLIC TESTING OPTIONS

4.1 GENERAL DESCRIPTION 4-1

4.2 PHYSICAL DESCRIPTION 4-3

4.3 TESTING FOR LOAD COILS 4-6

4.4 BATTERY REPLACEMENT 4-8

4.5 SPECIFICATIONS 4-9

INDEX i

SECTION I

INTRODUCTION

1.1 GENERAL INFORMATION

The TPI Model 82 DDS Test Unit is used for qualification turn-up testing of 4-wire local loop facilities used in DDS (Digital Data System) and Basic Digital Service offerings. Normally used at the Customer Premise, the Model 82 automatically configures itself to reflect the serving Central Office Channel Unit (OCU). Network generated Loopback capabilities include CSU & DSU Loopbacks and CSU & DSU Latching Loopbacks. Test capabilities include 511 and 2047 PRBS (Pseudo Random Bit Sequence) and QRS (Quasi Random Signal), in addition to the Pattern Sensitive (Stress) sequences. Received Byte Pattern LED's and Error Readouts per Channel make the Model 82 an easy-to-use Loop Tester. Battery power makes the Model 82 truly portable.

The DDS Test Unit has the capability of testing both the Primary and Secondary Channels (where applicable) at data rates of 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kbps.

1.1.1 DIGITAL NETWORK

Digital Data Networks are designed to provide highly reliable end-to-end digital service within the nation-wide telecommunications system. The first implementation of a digital network was not digital end-to-end, but had to make use of analog transmission systems for inter-city communications. Now, digital microwave radio and fiber optic transmission systems are available for long haul communications, making true end-to-end digital communications a reality.

There are two distinct advantages to transmitting data over a digital facility, as opposed to an analog facility:

1) Digital transmission is much less susceptible to noise, causing fewer errors.

2) Data can be transmitted at a much higher bit rate.

These two advantages are possible because transmission and reception of information in the digital format depends only on the detection of a pulse or no-pulse in a time slot, and does not look for variations in a sine wave to extract the information transmitted (as is the case in analog transmission).

Whether the customer chooses point-to-point service or multipoint, high quality transmission is provided and is safeguarded by stringent error rate and down-time objectives. Inherent with digital transmission systems such as DDS is the use of a highly accurate master timing supply to which an entire network is synchronized. Compatibility between networks must take into account the data format, timing signals, and the network control codes used in testing data facilities.

1.1.2 LOCAL LOOP

The DDS network, which is typical, can be engineered to meet individual customer needs, whether the customer is large or small. Typically, service consists of a digital facility that is terminated at each end by a local 4-wire loop. A Data Service Unit (DSU) and/or a Channel Service Unit (CSU) serves as the interface between the 4-wire local loop and the subscriber's Data Terminal Equipment (DTE). The DSU and CSU may be located in a single unit (referred to as a DSU), or they may be fabricated as separate pieces of equipment. In either case, the functions of the DSU/CSU remain the same. (The data sets, i.e. DSU/CSU, are referred to as Data Communication Equipment, or DCE.)

On the central office end of the 4-wire local loop, an OCU (Office Channel Unit) serves as the interface between the loop and the channel bank equipment. The channel bank combines (via time division multiplexing) up to 24 voice and/or data channels into a single 1.544 Mbps bit stream (DS-1 format).

Figure 1-1 illustrates a typical digital network with local loops to customer terminals.

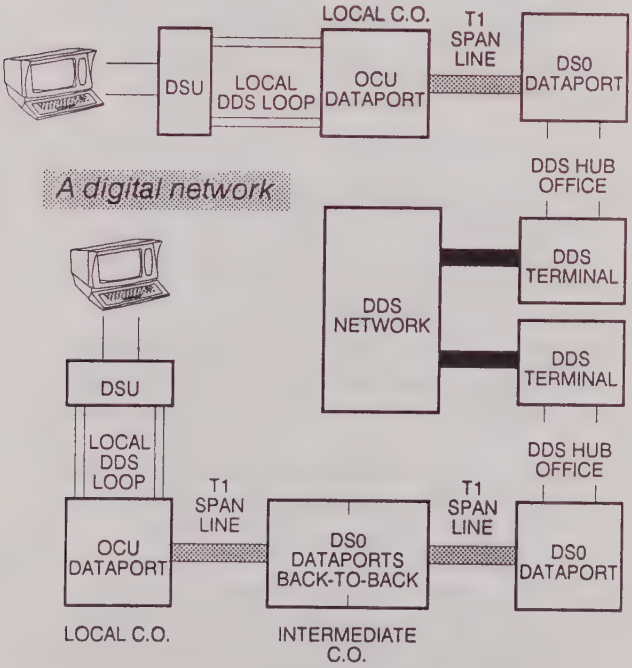


Figure 1-1

The signal format used to transmit data bits between the customer DTE and the DSU is Unipolar Pulses, while on the local loop the digital pulses are always Bipolar Return to Zero. The bit rate is customer optional to meet the rate requirements of their DTE. These "baseband" rates may be 2.4, 4.8, 9.6, 19.2, 38.4, 56, or 64 Kbps.

There are several advantages of using bipolar pulses:

1) Cuts frequency response time in half. This allows a higher bit rate on a cable pair, doubling the information that can be sent by using unipolar pulses.

2) Reduces the D.C. component on the local facility by alternating positive and negative pulses. D.C. voltages affect some loop tests.

3) As an error detector - two successive pulses of the same polarity means that an error has occurred. (called a "Bipolar Violation")

4) For control and supervisory codes - for example, the codes that are used to remotely initiate and release the loopback on the DSU make use of bipolar violations.

1.1.3 DATA SERVICE UNIT

The primary purpose of the DSU is to work in conjunction with the CSU to provide CPE access to the digital network. The DSU performs these functions:

1) Accepts unipolar pulses from the CPE, converts them to bipolar, and sends them to the CSU.

2) Accepts bipolar pulses from the CSU, converts them to unipolar, and sends them to the CPE.

3) Performs the RT (Remote Terminal) loopback feature that opens the transmit and receive leads to the CPE as it loops the transmit and receive leads back to the CSU (network). The RT loopback may be initiated locally at the DSU, or remotely.

1.1.4 CHANNEL SERVICE UNIT

The CSU performs three basic functions:

1) Accepts serial data in the bipolar format from the DSU and transmits it on the local loop to the serving central office.

2) Accepts serial, bipolar signals from the central office and transmits them to the DSU.

3) Provides a loopback feature. (Polarity of the simplex current controls the loopback function.)

1.1.5 OFFICE CHANNEL UNIT

The OCU (Office Channel Unit) performs 5 functions in serving as the link between the local loop and the serving central office:

1) Converts baseband data received from the local customer to the DSOA rate - 64 Kbps. The customer rate may be 2.4, 4.8, 9.6, 19.2, 38.4, 56, or 64 Kbps. Except for 56 and 64 Kbps, this conversion is accomplished through the process called "Byte Stuffing." For 56 Kbps service, the DSOA signal is created by adding one network control bit (bit 8) to every seven bits of customer data (there is no conversion at the 64 Kbps customer rate). The result is a 64 Kbps signal.

2) Decodes the 64 Kbps DSOA rate received from the network side and sends the proper rate to the local customer.

3) Performs line conditioning for the local loop (loss and bit speed conditioning).

4) Recognizes CSU loopback codes and performs the operations necessary to control the loopback functions.

5) Recognizes the OCU loopback code from the network side and places (or releases) the OCU in the loopback mode. The OCU loops back on the network side.

Access for performing digital tests on the OCU, local loop, and CSU/DSU is provided at the DSOA signal point. This access may be made by manually connecting a test set at the appropriate equipment location, or remotely through a SMAS (Switched Maintenance Access System) test point.

1.1.6 SECONDARY CHANNEL

OCU's, DSU's, and CSU's are available in the baseband rates 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kbps. Recent offerings are also equipped for Secondary Channel transmission, for all baseband rates except 64 Kbps.

The Secondary Channel is a second transmission path, using the same facilities as primary transmission. Its purpose is to provide the customer with a channel over which network monitoring and diagnostic functions can be performed. The secondary channel operates at a much lower speed than the primary. For example, the secondary channel bandwidth available for 4.8 Kbps is 266.66 bps.

The secondary channel utilizes every third control bit for its transmission. On the local loop, secondary channel operation is accomplished by adding a leading bit (framing bit) and a trailing bit (control code and secondary channel data) to each 6 bits of primary channel data. In the 4.8 Kbps example, the local loop must be capable of transmitting at a 6.4 Kbps rate in order to handle the primary and secondary transmission.

SECONDARY CHANNEL OPERATION

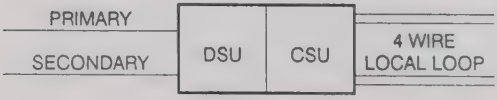


Figure 1-2

CHANNEL AND LOOP SPEED CALCULATIONS

PRIMARY CHAN	SECONDARY CHAN	LOOP SPEED
2400	133 1/3	3200
4800	266 2/3	6400
9600	533 1/3	12800
56000	2666 2/3	72000

Figure 1-3

1.1.7 DSOB SIGNALS

Within the telephone network, several subrate channels can be interleaved in the same 64 Kbps signal without loss of information by removing the redundancy in each DSOA signal. The resulting signal is called a "DSOB" signal. A single DSOB signal can carry up to five 9.6 Kbps customer channels, ten 4.8 Kbps channels, or twenty 2.4 Kbps channels. Unlike the DSOA signal, a fully utilized DSOB signal contains only a single copy of each network byte; successive network bytes contain data from different customers. A subrate framing pattern (shown on the next page) is placed in the first bit position in order to allow the individual channels to be identified when the DSOB signal is demultiplexed.

SPEED	PATTERN (bit 1)
9.6	01100
4.8	01100 10100
2.4	01100 10100 11100 00100

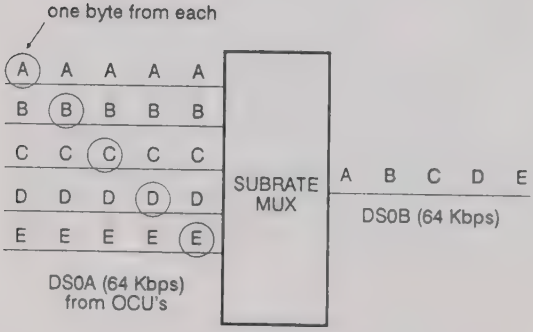


Figure 1-4

1.1.8 DS-1

The next step in multiplexing is to combine, in channel bank equipment, the 64 Kbps signal with up to 23 other DSOB or DSOA signals to form a DS-1 formatted signal which runs at a bit rate of 1.544 Mb/s. This signal may then be transmitted on a T1 carrier facility, or multiplexed with other DS-1 signals to be transmitted on a facility capable of transmittiing at a higher bit rate. This facility might be digital microwave radio, coaxial cable, or light guide.

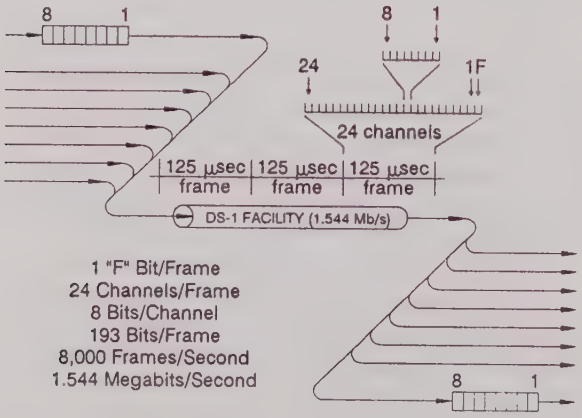


Figure 1-5, Data transmission through the network

1.1.9 OCUDP

The alternative to converting the DSOA format to DSOB, before multiplexing to the 1.544 Mb/s rate, is the OCUDP. The customer baseband signal (2.4, 4.8, 9.6, 19.2, 38.4, 56 or 64 Kbps) may be terminated in an OCU that is a part of the channel bank equipment. This type of OCU is referred to as an OCUDP, or Dataport Service. Byte stuffing occurs as in a standard OCU, but the DSOA signal is directly multiplexed into the DS-1 bit stream without going through the transformation to the DSOB format.

While this method does not provide us with the most efficient use of the facilities, it does give the customer virtually error free transmission through the network. This is possible because the receive end examines each bit pattern in the multiple copies of the bytes of the DSOA signal. Whatever bit pattern in the received bytes occurs the majority of times is taken as the actual customer transmission. The only way an error can be introduced in the bit stream is if the same errored bit is injected in the majority of the bytes that have been "stuffed." This process is referred to as "Majority-Vote" error correction.

For 56 and 64 Kbps service, the "Majority-Vote" error correction technique does not apply. Error correction can, however, be accomplished for 56 Kbps circuits by a different technique that employs two time slots on a DS-1 signal.

DATAPORT ARCHITECTURE

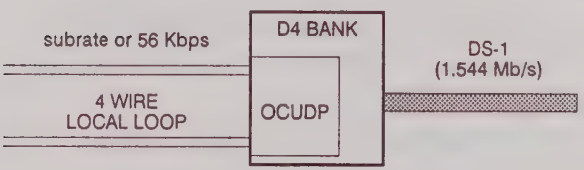


Figure 1-6

1.1.10 56 Kbps REPEATER

Since the transmission losses on 56 Kbps local loops are much greater than for 2.4 - 19.2 Kbps service, a 56 Kb/s regenerator must be used for long loops. Up to two 56 Kbps regenerators may be used to extend a loop.

There are two types of 56 Kbps regenerators:

1) central office

2) outside plant (manhole or pole mounted)

The 56 Kb/s regenerator is line powered by voltage fed from the shelf.

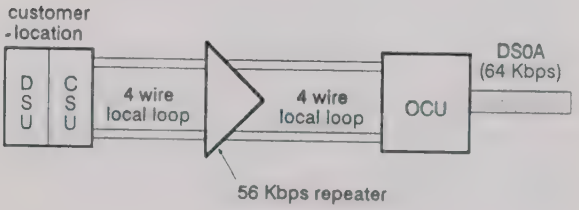


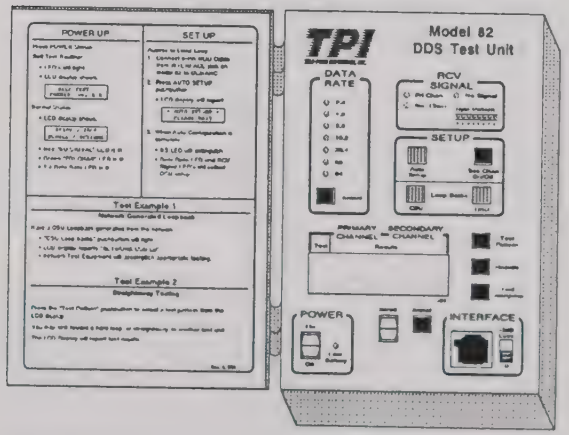
Figure 1-7

The regenerator may be looped back by sending the proper bipolar violation code to the OCU, which reverses the polarity of the simplex current. This is the same process that is used to loop back the CSU, so caution must be observed when you are testing on a loop that includes a 56 Kbps regenerator.

In order to make metallic loop tests (DC continuity, noise, and loss) from the central office to the customer location, the 56 Kbps regenerator(s) must be bypassed.

1.2 PHYSICAL DESCRIPTION

The TPI Model 82 DDS Test Unit consists of circuit boards and a battery pack housed in a rugged aluminum case. It weighs 4 pounds and has external dimensions of 8½ inches high, 5½ inches wide, and 4½ inches deep.



An aluminum hinged cover attaches to the side of the unit to protect the control panel when the unit is being transported. The cover is secured by a front latch that snaps loose and unhooks.

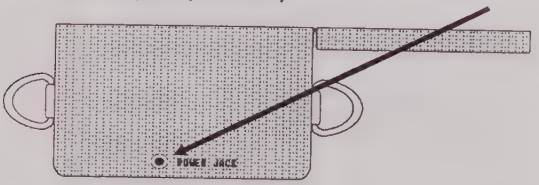
A D-ring is attached to both sides of the unit for convenience to allow attachment of a carry strap (the Soft Pack Carry Case shoulder strap may be used).

The hinged cover houses a Test Summary Label that details unit operation.

1.2.1 EXTERNAL CONNECTIONS

Connections to the network are made on the front panel via the 8-pin modular "INTERFACE" jack.

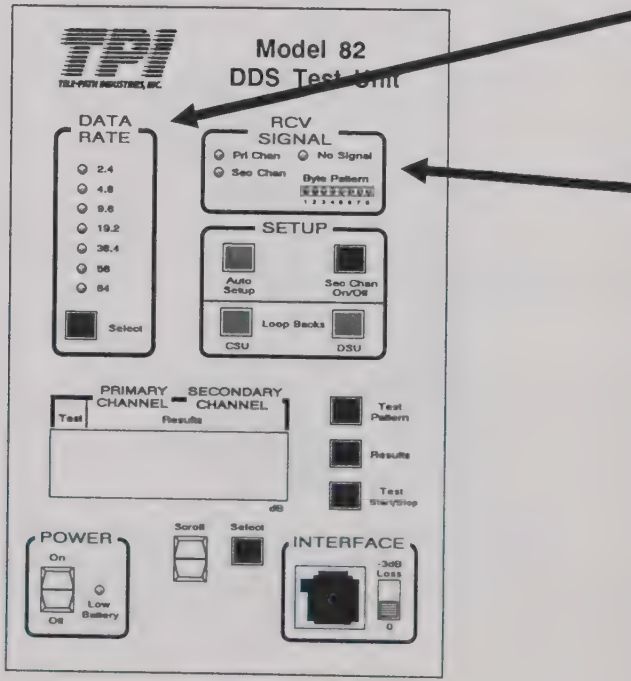
As shown below, the top side of the case houses a jack for an AC Adapter (TPI 82-1).



NOTE: *The AC Adapter Cord should always be connected to the Model 82 "POWER JACK" before plugging the adapter into a 110V AC wall outlet.*

1.2.2 CONTROLS AND INDICATORS

The control panel contains pushbuttons and switches to condition the unit and light-emitting diodes (LED's) as status indicators.



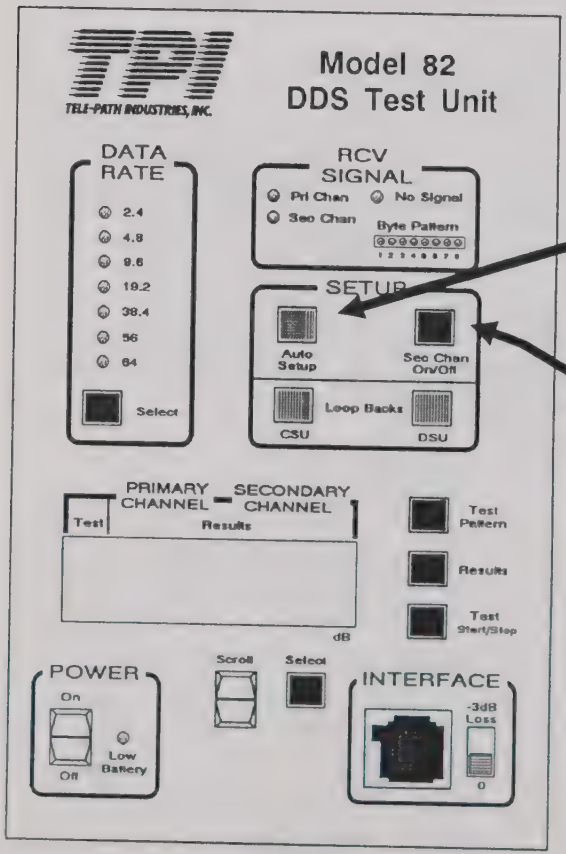
A description of the controls, indicators, and counters is given below:

DATA RATE Select

The DATA RATE Select is a pushbutton activated, LED indicating, step function device. Depressing the pushbutton selects the next highest data rate available.

RCV SIGNAL Area

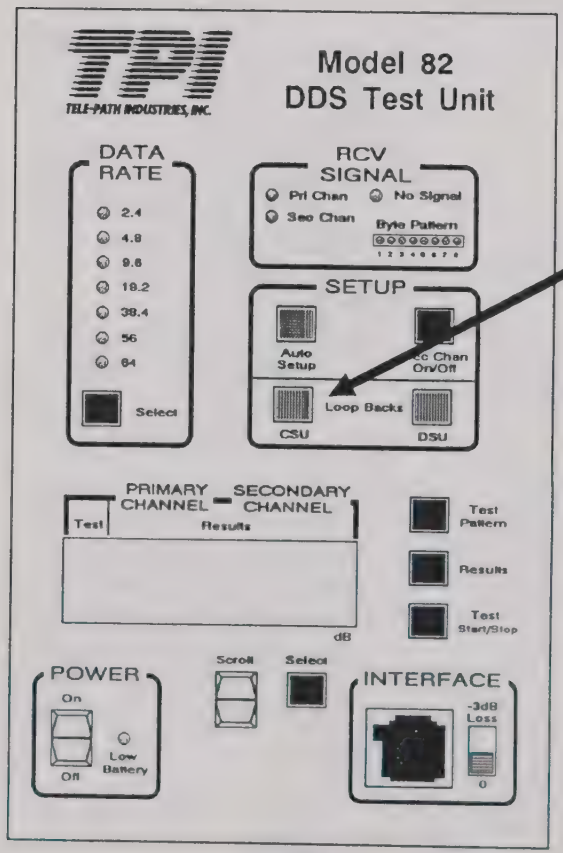
The RCV SIGNAL area houses the "Pri Chan", "Sec Chan", and "No Signal" status LED's, and a Received Byte Pattern display. These LED's give an indication of the state of received signals.


TELE-PATH INDUSTRIES, INC.
Model 82
DDS Test Unit
DATA RATE
2.4
4.8
9.6
19.2
38.4
56
64
Select
RCV SIGNAL
Pri Chan
No Signal
Sec Chan
Byte Pattern
1 2 3 4 5 6 7 8
SETUP
Auto Setup
Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

SETUP Area

Auto Setup - This lighted pushbutton, when pressed, will auto configure the unit to the circuit being tested. If this button is pressed during a test, the test will be corrupted. NOTE: It may take up to 20 seconds to auto configure at worse case conditions. The Model 82 will not auto configure on 64 Kbps settings; it must be manually set (since 64 Kbps translates to 56 Kbps-Secondary Channel).

Sec Chan On/Off - This pushbutton, when pressed, will turn the Secondary Channel ON or OFF. The RCV SIGNAL "Sec Chan" LED will light when the Secondary Channel is enabled and will extinguish when Secondary Channel is turned off.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Test
Results
dB
Test Pattern
Results
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

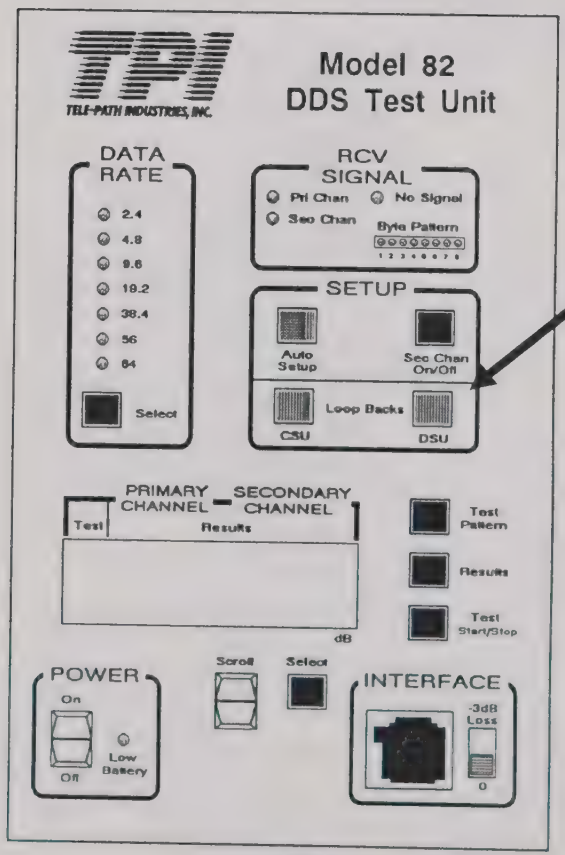
SETUP Area (continued)

CSU Loopback - This lighted pushbutton, when pressed, will allow the CSU to be manually looped. The LCD will display:

```
LOCAL CSU LB
XXXXXXXXXXXXXXXX
```

The X's on the bottom line will be replaced with the last Scroll Option selected.

Pressing the CSU Loopback pushbutton again will terminate the loopback and extinguish the light.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1 2 3 4 5 6 7 8
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PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

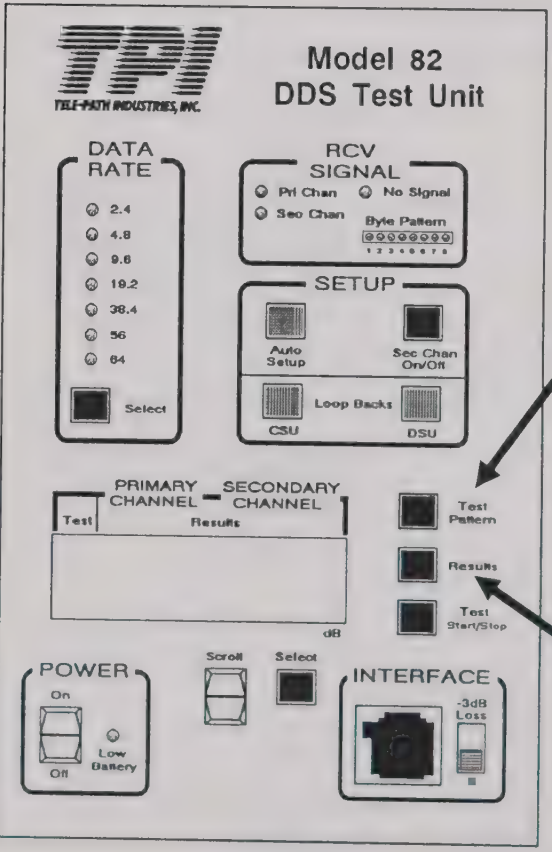
SETUP Area (continued)

DSU Loopback - This lighted pushbutton, when pressed, will allow the DSU to be manually looped. The LCD will display:

```
LOCAL DSU LB
XXXXXXXXXXXXXXXX
```

The X's on the bottom line will be replaced with the last Scroll Option selected.

Pressing the DSU Loopback pushbutton again will terminate the loopback and extinguish the light.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PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss

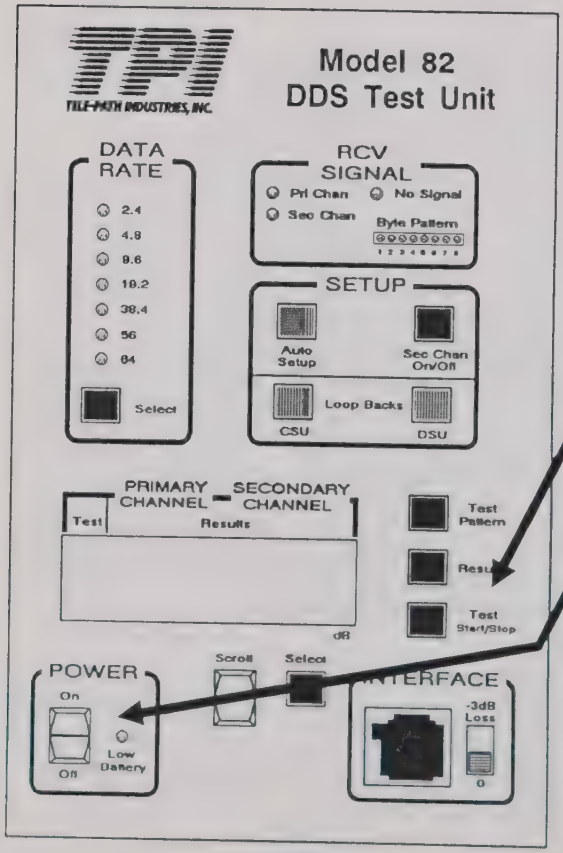
TEST PATTERN

This Pushbutton, when pressed, allows the Test Pattern (511, 2047, & Pattern Sensitive Sequences) to be selected from the top line of the LCD. When in the "READY/IDLE" mode, all ones is being transmitted.

Primary Channel testing may be conducted with either 511 or 2047 Pseudo Random words, or any of the pattern sensitive (stress) sequences, defined in figure 2-1. Conducting simultaneous testing (PRI & SEC) at the 56 kbps data rate, in either of the 511 or 2047 test mode selections will cause a Quasi Random signal (QRS) to be transmitted in the Primary Channel, while a Pseudo Random bit sequence (PRBS) is transmitted in the Secondary Channel. To select PRBS in both PRI and SEC Channels simultaneously at the 56Kbps Data Rate, (CAUTION!! This may introduce more zero's than allowed by the network) depress the TEST PATTERN pushbutton a second time after the 511 or 2047 selection appears.

RESULTS

The RESULTS Pushbutton, when pressed, allows the test results (Bit Errors, Errored Seconds, %Error Free Seconds, Bit Error Rate) to be selected and displayed on the top line of the LCD.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Sec Chan
Byte Pattern
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SETUP
Auto Setup
Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

TEST START/STOP

The TEST START/STOP Pushbutton is used to start or stop a test, and reset the Timer and Error Counts.

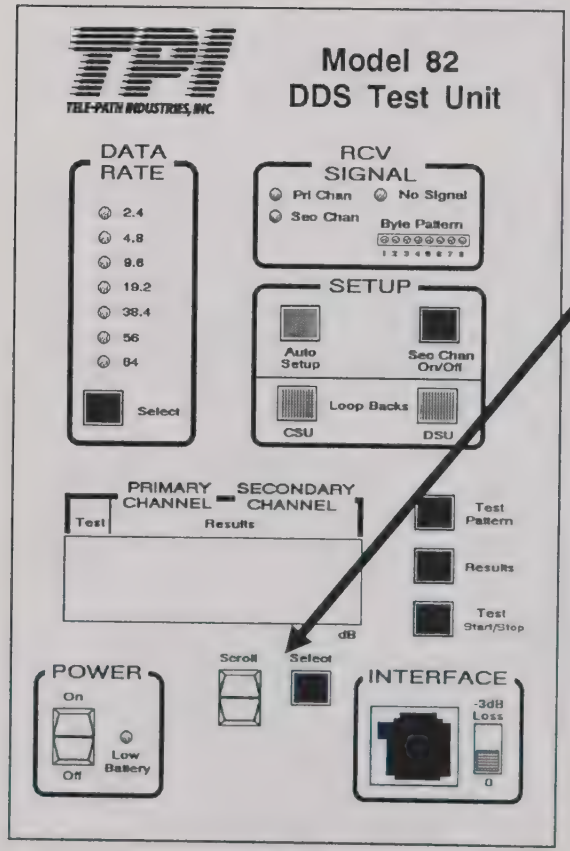
POWER

The POWER Switch is used to turn the DDS Test Unit ON and OFF.

If there is no activity (keystroke or network controls) for 5 minutes, the Model 82 will turn itself off to conserve battery life. This function can be disabled by scrolling to the menu "AUTO SHUT OFF OR" and pressing the "Select" push-button.

If when powered up the "Low Battery" LED lights, the unit will only be functional for approximately 5 minutes; also, if the battery is too low, the unit may not power up at all.The average battery life is approximately 18 hours.

CAUTION: *The 5 minute low battery warning is only approximate, and will depend on several factors. To insure proper operation throughout the testing procedures, we recommend that you replace the batteries as soon as the warning LED lights.*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Select
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Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
Scroll
Select
POWER
On
Off
Low Battery
INTERFACE
-3dB Loss
0

SCROLL

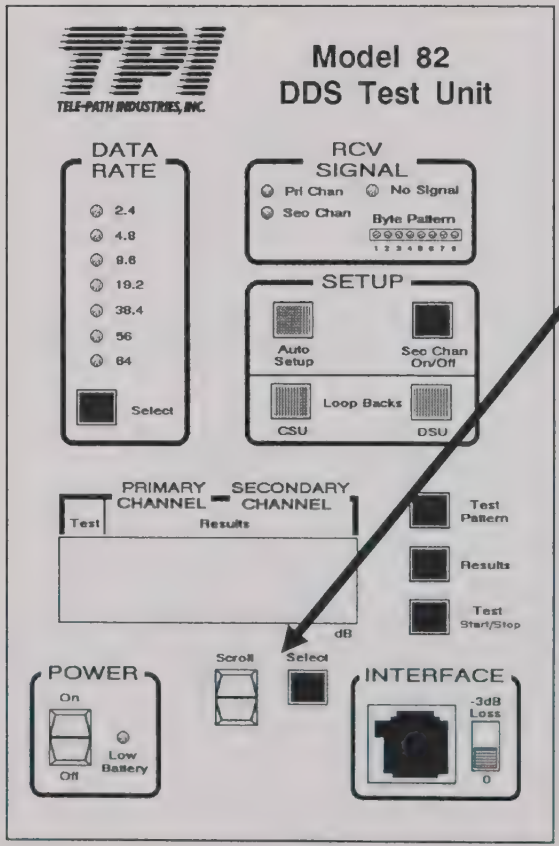
The SCROLL Switch is a rocker switch used to scroll forward or backward through menu selections on the bottom line of the LCD. This switch is used to SELECT EXTENDED RANGE, SELECT BACKLIGHTING, SELECT LOCAL CLOCK, SET THE TIMER, SET THE TEST DURATION, INSERT ERRORS, SELECT AUTO SHUT OFF, TRANSMIT V.54 LOOPBACK, and SELECT SONALERT. A brief description of each follows:

EXT RANGE allows selection of Extended Range Testing. Pressing "Select" will enable the Extended Range feature.

BACKLIGHT allows selection of LCD Backlighting. Pressing "Select" will turn the Backlight on.

LOCAL CLK turns the Local Clock on or off. Pressing "Select" will turn the Local Clock option on.

TIMER displays the Test Time. "Test Start/Stop" will start or stop the Timer. The timer has an elapsed time display limit of 9 hours and 99 minutes. After this limit has been reached, the timer will overflow with an "*" displayed in the tens of hours position.


TELE-PATH INDUSTRIES, INC.
Model 82
DDS Test Unit
DATA RATE
2.4
4.8
9.6
19.2
38.4
56
64
Select
RCV SIGNAL
Pri Chan
No Signal
Sec Chan
Byte Pattern
1 2 3 4 5 6 7 8
SETUP
Auto Setup
Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
Scroll
Select
POWER
On
Off
Low Battery
INTERFACE
-3dB Loss
0

SCROLL (continued)

TESTDUR allows setting of the Test Duration. Pressing "Select" will scroll through the following selections: CONT, 5 MIN, 15 MIN, and 60 MIN. Pressing "Scroll" will enable the selected Test Duration.

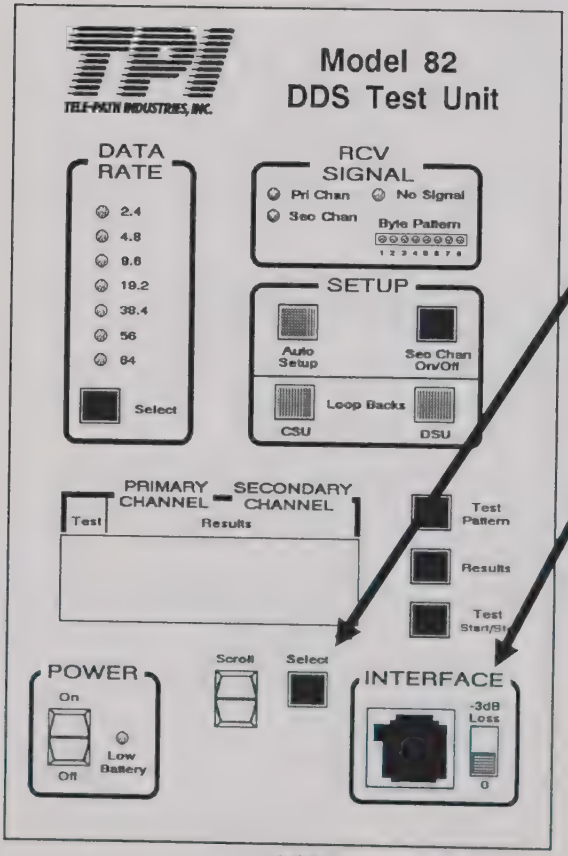
INSERT 6 ERRORS allows Error Insertion in Primary and/or Secondary Channels. Press "Select" to insert errors.

AUTO SHUT OFF allows selection of the Auto Shut Off feature. Pressing "Select" will disable the feature.

V.54 LB allows transmission of V.54 Loopback code. Pressing "Select" will transmit the code to enable/disable the V.54 Loopback.

SONALERT allows selection of an audible "beep" when an error is detected. Pressing "Select" will turn the Sonalert on.

TEST IN PROGRESS and **END OF TEST** reports test status.


TELE-PATH INDUSTRIES, INC.
Model 82
DDS Test Unit
DATA RATE
2.4
4.8
9.6
19.2
38.4
56
64
Select
RCV SIGNAL
Pri Chan
No Signal
Sec Chan
Byte Pattern
1 2 3 4 5 6 7 8
SETUP
Auto Setup
Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
Test Pattern
Results
Test Start/St
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

SELECT Pushbutton

The SELECT Pushbutton is used to select a menu item or scroll through selections.

INTERFACE Area

All external connections to the Model 82 DDS Test Unit are made through the jack provided in this area of the front panel. The jack is an 8-pin modular Telco jack.

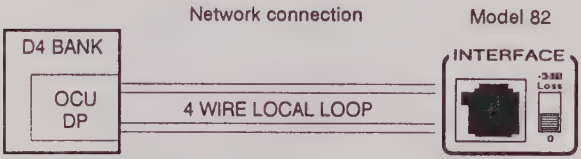
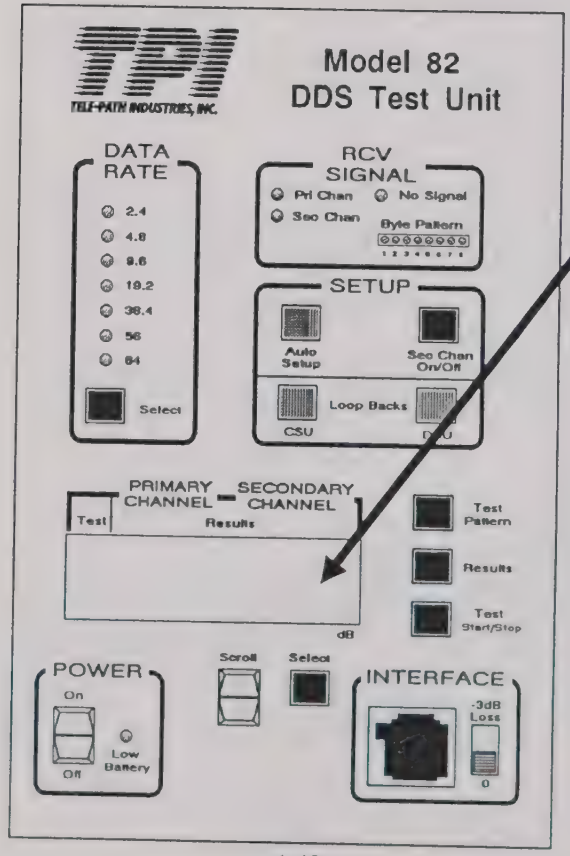


Figure 1-8

The pin designations for the 8-pin modular Telco interface are as follows:

PIN NUMBER	FUNCTION	PIN NUMBER	FUNCTION
1	R1	5	NOT USED
2	T1	6	NOT USED
3	NOT USED	7	T
4	NOT USED	8	R

The -3dB Loss slide switch is used to place an additional -3dB loss on the circuit.


TELE-PATH INDUSTRIES, INC.
Model 82
DDS Test Unit
DATA RATE
2.4
4.8
9.6
19.2
38.4
56
64
Select
RCV SIGNAL
Pri Chan
No Signal
Sec Chan
Byte Pattern
1 2 3 4 5 6 7 8
SETUP
Auto Setup
Sec Chan On/Off
Loop Backs
CSU
DSU
PRIMARY CHANNEL
SECONDARY CHANNEL
Test
Results
dB
Test Pattern
Results
Test Start/Stop
POWER
On
Off
Low Battery
Scroll
Select
INTERFACE
-3dB Loss
0

LCD Display

The LCD is used to display status, test results, and menu selections. Primary and Secondary Channel results will be displayed seperately, in addition to the test currently being conducted, and the circuit line loss being experienced (dB).

A typical example of an LCD display would be as follows:

Test	PRIMARY CHANNEL Results	SECONDARY CHANNEL
2047	0 BE	0
INSERT 6 ERRS		17
		dB

In the example above, a 2047 test pattern is being transmitted and received in both primary and secondary channels simultaneously. Test results displayed are "0" Bit Errors (BE). The amount of line loss on the circuit is approximately -17 dB.

NOTES:

"<9" dB indicates a dB reading below -9 dB.

"OR" dB indicates an Out of Range dB reading.

"IDL" Secondary Channel results indicates that only IDLE code is being transmitted.

An "" in either Primary or Secondary Channel results indicates an Overflow condition.*

"OFF" Secondary Channel Results means that Secondary Channel functions are not enabled.

1.2.3 TEST PATTERNS

The following table shows what is transmitted in which channel. This also depends on the data rate selected.

TEST PATTERN	Data Rate (Kb/s)	Pri. Chan. Transmission	[1]Sec. Chan. Transmission
OFF	any	Idle (all 1's)	Idle (all 1's)
511 or 2047	2.4 - 38.4	PRBS	PRBS
511 or 2047	56	[2]QRS	PRBS
511 or 2047	64	PRBS	N/A
PTN1 - 5	2.4-38.4, 56PRI	Ptn. Sen.	Idle (all 1's)
PTN1 - 5	64	Ptn. Sen.	N/A

[1]Secondary Channel must be ON (Sec Chan LED will be lit).

[2]QRS (Quasi Random Signal) is a form of PRBS (Pseudo Random Bit Sequence) that has been altered to transmit no more than six zero's into the network.

1.2.4 CABLES AND ACCESSORIES

The Model 82 DDS Test Unit comes equipped with the following cables and accessories:

PART #	DESCRIPTION
TPI 82-B (Mfg. Part # 825152)	Battery Pack (Ten "AA" Batteries)
TPI 82-1 (Mfg. Part # 851560)	AC Adapter (120VAC, to 9VDC, 500mA) (Jack on top of unit)
TPI 82-2 (Mfg. Part # 834005)	8-Pin Mod to 8-Pin Mod Cable
TPI 82-3 (Mfg. Part # 835965)	8-Pin Mod to 4-Clip Leads Cable
TPI 82-4 (Mfg. Part # 837190)	Soft Pack Carry Case

NOTE: *The AC Adapter Cord should always be connected to the Model 82 "POWER JACK" before plugging the adapter into a 110V AC wall outlet.*

The Model 82 DDS Test Unit has several optional features and accessories which may be ordered as well:

PART #	DESCRIPTION
TPI 82-5 (Mfg. Part # 834035)	8-Pin Mod to 4-Clip Leads Cable (HD)
TPI 82-6 (Mfg. Part # 835967)	8-Pin MOD to Twin Bantams Cable
TPI 82-56	SW-56 Firmware (4-Wire)
TPI 82-M/LC	Metallic / Load Coil Lid
TPI 82-DP	SW-56 Datapath Pod (2-Wire)
TPI 82-DOV	Data Over Voice Pod

1.3 FUNCTIONAL DESCRIPTION

1.3.1 APPLICATION

The DDS Test Unit, TPI Model 82, is used to verify the presence of a good circuit from the customer premise to the serving central office. Its testing capabilities support data rates of 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kbps (plus the corresponding rate for secondary channel capable circuits). The DDS Test Unit can transmit and receive 511/2047 Pseudo-Random Bit Sequences (PRBS), 511/2047 Quasi Random Signals (QRS), or pattern-sensitive sequences(see Figure 2-1) in the Primary Channel (511 or 2047 Pseudo-Random Bit Sequences in the Secondary Channel). It also indicates Bit Errors, Errored Seconds, %Error Free Seconds, and Bit Error Rates on each Channel. It is compatible with industry standards, including the ability to test both the Primary and Secondary Channels simultaneously at all data rates.

Typical applications include:

Local Loop, four wire DDS

LOOPBACK - Network to Model 82 Primary & Secondary Channel

STRAIGHTAWAY - Model 82 to Network Primary & Secondary Channel
Network to Model 82 Primary & Secondary Channel

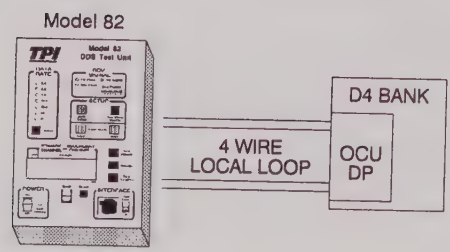


Figure 1-9

Local Loop, four wire DDS

LOOPBACK - Model 82 to Model 82

STRAIGHTAWAY - Model 82 to Model 82 Looped

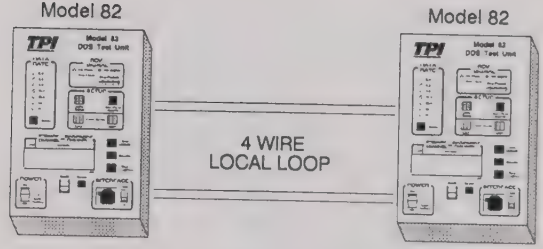


Figure 1-10

1.3.2 MAINTENANCE

The only replaceable parts on the Model 82 are the batteries and the external cords. The LED indicators and displays are soldered into the unit and are not field replaceable.

If the Model 82 should become suspect, the unit may be checked for proper operation by performing a POWER-UP SELF TEST (see paragraph 2.1). If this procedure does not operate successfully, contact the factory Customer Service department at 703-982-8844.

CALIBRATION

Calibration is not required for the Model 82, due to the digital nature of its design, and due to the synchronous nature of the derived timing from DDS networks. If proper operation of the Model 82 is in question, the POWER-UP SELF TEST procedure mentioned above may be performed.

1.4 BATTERY REPLACEMENT

The battery pack is located inside the bottom of the unit.

The average battery life is approximately 18 hours.

To replace the batteries, unscrew the four screws and remove the cover plate from the bottom of the unit.

Replace the batteries with ten "AA" batteries as shown below:

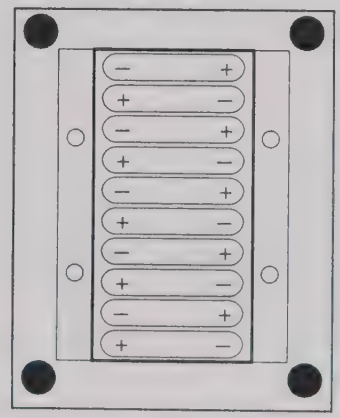


Figure 1-11

After replacing the batteries, reposition the cover plate, press down on it, and tighten the screws.

1.5 SPECIFICATIONS

TEST CAPABILITY

Primary Channel

- XMT/RCV 511 or 2047 Pseudorandom Words
- XMT/RCV 511 or 2047 QRS at 56 Kb/s Data Rate
- XMT/RCV Pattern Sensitive Sequences
- Display Bit Errors
- Display Errored Seconds
- Display % Error Free Seconds
- Display Bit Error Rate

Secondary Channel (Simultaneous with Primary)

- XMT 511 or 2047 Pseudorandom Words
- RCV 511 or 2047 Pseudorandom Words
- Display Bit Errors
- Display Errored Seconds
- Display % Error Free Seconds
- Display Bit Error Rate

Self Test

Extended Range/Normal Range Selection

NETWORK CODE COMPATIBILITY

- DSU Loopback
- CSU Loopback
- CSU Latching Loopback
- DSU Latching Loopback

DATA RATES SUPPORTED

2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kbps

CONTROLS

Data Rate Select
Auto Setup Pushbutton
Secondary Channel On/Off Pushbutton
Manual CSU Loopback Select
Manual DSU Loopback Select
Test Pattern Select
    511 / 2047 / PTN1 / PTN2 / PTN3 / PTN4 / PTN 5
Results Select
    BE / ES / %EFS / PRI BER / SEC BER
Test Start / Stop
-3db Loss Switch
Scroll Select
    Master Clock On / Off
    Timer (Elapsed Time Display Limit = 9 Hrs 99 Min)
    Test Duration (Default = Continuous)
    Insert 6 Errors
    Sonalert On / Off
    Ext Range On / Off
    Backlight On / Off

DISPLAYS

- Test
- Primary Channel Test Results
- Secondary Channel Test Results
- dB Level
- Low Battery
- Data Rate Selected
- Received Signal
  - Pri Chan
  - Sec Chan
  - No Signal
  - Byte Pattern
- Setup
  - Auto Setup
  - CSU Loopback
  - DSU Loopback

POWER

Battery Pack (Ten "AA" Replaceable Batteries)
Battery Life = Approx. 18 Hrs

AC Adapter
(120VAC, to 9VDC, 500mA)

ENVIRONMENTAL

OPERATING TEMP = 0°C to 50°C

STORAGE TEMP = -20°C to 70°C

PHYSICAL

Portable w/ Hinged Lid

8½"H x 5½"W x 4½"D

4 lbs.

SECTION II

USING THE MODEL 82 DDS TEST UNIT

2.1 POWER UP

Press the "POWER" switch. This will turn the Model 82 on, and will start the self test routine. The top line of the LCD will flash, various LED's will light and the RCV SIGNAL "Byte Pattern" LED's will flicker.

When the self test has concluded, the following screen will be displayed:

```
SELF TEST
PASSED  ver X.X
```

At the conclusion of the Self Test the following menu will result:

```
READY / IDLE
SCROLL / OPTIONS
```

The Model 82 DDS Test Unit is now ready for operation.

If when powered the "Low Battery" LED lights, the unit will only be functional for approximately 5 minutes; also, if the battery is too low, the unit may not power up at all. The average battery life is approximately 18 hours.

CAUTION:

The 5 minute low battery warning is only approximate, and will depend on several factors. To insure proper operation throughout the testing procedures, we recommend that you replace the batteries as soon as the warning LED lights.

If the Power On Self Test fails, contact Tele-Path Industries, 3602 Melrose Ave., N.W., Roanoke, VA 24017, phone (703) 982-8844, fax (703) 982-5825.

2.2 TEST INFORMATION

The procedures described herein relate to testing of the four wire digital loop from the telephone company to the customer interface. DDS and Basic Digital Service are two examples of services that utilize digital local loops.

2.2.1 DDS TEST UNIT SET-UP

Open the top cover on the Model 82 by unsnapping and unlocking the latch.

There are two cord sets provided for the network (TELCO) interface. One is a seven foot cable with 8-pin modular plugs at both ends, TPI 82-2 (Mfg. Part # 834005). The other is a seven foot cable with an 8-pin modular plug at one end and color-coded alligator clips at the other end, TPI 82-3 (Mfg. Part # 835965).

Below is a description of the color code:

T	= White	R	= Red
T1	= Black	R1	= Yellow

This table also appears on a label attached to this cord set (TPI 82-3) [Mfg. Part # 835965].

The Model 82 has one 8-pin modular receptacle (on the front panel). This is used for network access.

Connect the 8-pin modular plug on the TPI 82-2 (Mfg. Part # 834005) or TPI 82-3 (Mfg. Part # 835965) to the 8-pin modular jack on the front panel of the Model 82, and connect the other end to the TELCO interface.

Move the POWER rocker switch on the front panel to the ON position. At the conclusion of the Self Test, verify that the RCV SIGNAL "Pri Chan" LED is lit, as well as the "2.4" DATA RATE LED. If not, then replace the batteries.

Press the "Auto Setup" pushbutton. The following menu will result:

```
* AUTO SET-UP *
  PLEASE WAIT
```

The "No Signal" LED should go out (unless the network is transmitting all 0's). If it is illuminated, check the T, R, T1, & R1 connections.

When the auto configuration is complete, the Model 82 will be in the "READY/IDLE" state.

2.2.2 TEST ACCESS

Network access for Digital Testing must be gained via one of the two TELCO interface cables. Once accomplished, the Model 82 is ready to be used to verify the presence of a good circuit from the serving Central Office to the demarcation point at the Customer Premise.

2.2.3 TYPES OF TESTS

The Model 82 has the capability to conduct Simultaneous Testing in the Primary and Secondary Channels using 511 or 2047 PRBS (Pseudo-Random Bit Sequences). At the 56 Kbps data rate, the 511 or 2047 QRS (Quasi-Random Signal) is used in the Primary Channel, as per industry standards regarding Simultaneous Testing. Pattern Sensitive Sequences (see table below) may also be used in the Primary Channel. Bit Errors, Errored Seconds, % Error Free Seconds, or Bit Error Rate (BER) on both Primary and Secondary Channels are results available for selection.

TEST	CONTENTS
PTN1	100 octets of all 1's, followed by 100 octets of all 0's
PTN2	100 octets of "01111110", and 100 octets of all 0's
PTN3	01001100 continuously repeated
PTN4	01000000 continuously repeated
PTN5	A combination of test patterns 1-4

Figure 2-1

The Model 82 is compatible with embedded network test equipment and allows Straightaway Testing with the 511 and 2047 Pseudo-Random Bit Sequences in both channels, or Pattern Sensitive Sequences in the Primary Channel. Bit errors in groups of six can be inserted into the transmitted test data in both Channels.

The Model 82 is equipped with CSU and DSU loopback capability and indicators, as well as CSU and DSU latching loopback capability.

NOTES:

The 64 Kbps data rate should only be used in circuits having a zero substitution feature, such as B8ZS.

Many of the test patterns that are transmitted contain excessive zeros. If the network being tested at the 64 Kbps data rate does not have a zero substitution feature, these portions of the test data will cause network violations.

2.3 TYPICAL APPLICATIONS

2.3.1 LOOPBACK TO NETWORK

The Model 82 has the capability to establish local (CSU) and remote (DSU) Loopbacks to allow Network Test Equipment to perform Loopback confidence testing on a four wire local loop.

TYPICAL CIRCUIT

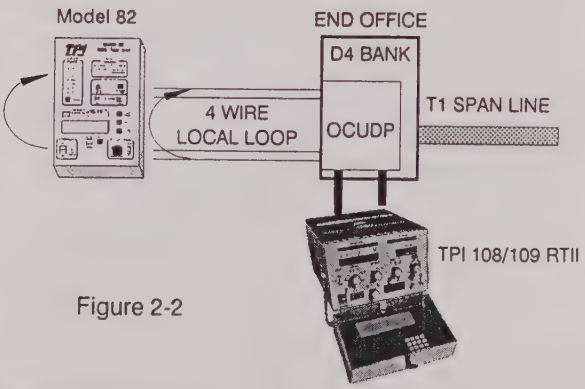


Figure 2-2

MODEL 82 SETUP

Set up as per Section 2.2.1.

NOTE:

If the Model 82 is in the "READY/IDLE" mode, there is no test being conducted by the Model 82; it will respond to a Network Test Equipment initiated CSU or DSU Loopback Test in any test mode.

PROCEDURE

ACTION - Initiate a **CSU Loopback Test** from the **Network Data Test Unit**.

RESPONSE - The Model 82 "CSU" pushbutton will illuminate and the LCD will show:

```
NETWORK CSU LB
XXXXXXXXXXXXXXXX
```

The X's on the bottom line will be replaced with the last Scroll Option selected.
On the **Network Data Test Unit**, the counter should lock and allow either Bit Error or Errored Second Testing to be accomplished.

ACTION - Initiate a **DSU Loopback Test** from the **Network Test Unit**.

RESPONSE - The Model 82 "DSU" pushbutton will illuminate and the LCD will show:

```
NETWORK DSU LB
XXXXXXXXXXXXXXXX
```

The X's on the bottom line will be replaced with the last Scroll Option selected.
On the **Network Data Test Unit**, the counter should lock and allow either Bit Error or Errored Second Testing to be accomplished.

2.3.2 STRAIGHTAWAY TESTING, FOUR WIRE LOCAL LOOP

Straightaway Testing can be accomplished when access to a circuit is gained at two different points, e.g., the end of the local loop at the Customer Premise and at some point in the Network. The Model 82 and the Network Test Equipment can each transmit, or transmit and receive simultaneously, a known test pattern toward the other. The data received by each is analyzed.

TYPICAL CIRCUIT

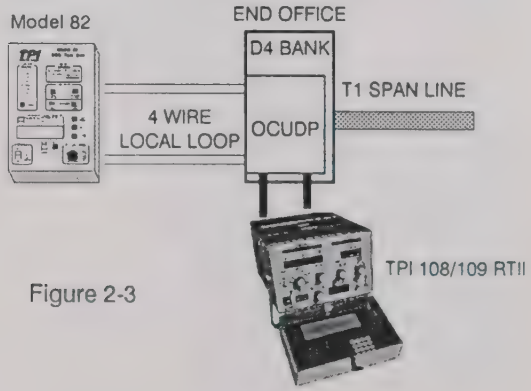


Figure 2-3

MODEL 82 SETUP

Set up as per Section 2.2.1.

PROCEDURE FOR PRIMARY CHANNEL TESTING

NOTE:

This example refers to cooperative testing with **TPI's Data Test Unit Model 108/109 RT II** *as the* **Network Data Test Unit** *at the near end OCUDP (setup must be consistent with the Model 82's setup).*

ACTION - Connect the **Data Test Unit** Signal and Clock leads to a D4 Channel Bank via the appropriate OCU Dataport Card and timing source, and initiate the proper testing sequence (511, 2047, or pattern sensitive).

ACTION - Depress the "**Test Pattern**" Pushbutton on the **Model 82** until the **Network Data Test Unit** Test Pattern is matched.

RESPONSE - The Primary Channel Error Counter on the **Model 82** LCD and the ERROR COUNTER on the **Data Test Unit** should lock. Reset both counters (Model 82 "**Test Start/Stop**" two times). The counters should hold at zero.

ACTION - Errors may be inserted in either direction. Press the "**Scroll**" button to display the "INSERT 6 ERRORS" message on the bottom line of the LCD. Pressing the "**Select**" pushbutton will Insert 6 Bit Errors or 1 Errored Second.

RESPONSE - The **Network Data Test Unit**'s ERROR COUNT will display 6 bit errors. **Model 82**'s Counters will remain locked.

ACTION - Depress the "Insert 6 Errors" Pushbutton on the **Network Data Test Unit**.

RESPONSE - The **Model 82**'s Primary Channel Error Count display will indicate errors. The **Network Data Test Unit**'s Counter will remain locked.

PROCEDURE FOR SECONDARY CHANNEL TESTING

NOTE:

The Pattern Sensitive Sequences apply to Primary Channel testing only; idle code will be transmitted in the Secondary Channel.

The procedure for Secondary Channel testing is only applicable to circuits that are optioned for Secondary Channel operation.

ACTION - Set up the **Network Data Test Unit** for Secondary Channel, 511 or 2047 Transmit & Receive Testing [e.g. KEYPAD (5, 3, 1)].

RESPONSE - The **Model 82**'s Secondary Channel Error Counter will lock and the **Network Data Test Unit** Keypad display will indicate zero S.C. errors and zero Block errors (errored seconds). Reset the **Model 82**'s Error Counters ("**Test Start/Stop**" twice).

ACTION - Errors may be inserted in either direction. Pressing "**Select**" while the "INSERT 6 ERRORS" message is displayed on the **Model 82** LCD will insert errors.

RESPONSE - The **Network Data Test Unit**'s Keypad Display will indicate "6" S.C. errors and typically "1" Block error (errored second).

ACTION - Change a switch setting on the **Network Data Test Unit**, e.g., temporarily move the INPUT/OUTPUT switch.

RESPONSE - The **Model 82**'s Primary and Secondary Channel Error Counters will display errors.

NOTES:

Recent versions of TPI's 108/109 RT II Data Test Unit allow both Primary and Secondary Channels to be tested simultaneously at all data rates with either 511 or 2047.

The 64 Kbps data rate should only be used in circuits having a zero substitution feature, such as B8ZS.

Many of the test patterns that are transmitted contain excessive zeros. If the network being tested at the 64 Kb/s data rate does not have a zero substitution feature, these portions of the test data will cause network violations.

2.3.3 LOOPBACK TO LOCAL LOOP

The Model 82 can conduct either Bit Error or Block Error (Errored Second) testing on the Local Loop when a hard loop is placed on the OCU Dataport Card. These tests can be accomplished on Secondary Channel optioned circuits or on Primary Channel only circuits.

TYPICAL CIRCUIT

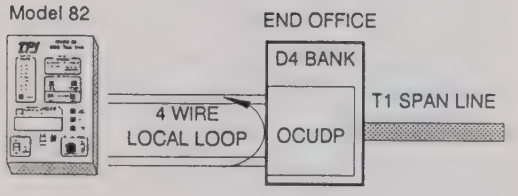


Figure 2-4

MODEL 82 SETUP

Set up the cords as per Section 2.2.1.

NOTES:

If the Model 82 is in the "READY/IDLE" mode, there is no test being conducted by the Model 82; it will respond to a Network Test Equipment initiated CSU or DSU loopback test in any mode.

Pattern Sensitive Sequences apply to Primary Channel testing only; idle code will be transmitted in the Secondary Channel, and the Secondary Channel error display will show IDL when any of these test patterns is selected.

The 64 Kbps data rate should only be used in circuits having a zero substitution feature, such as B8ZS.

NOTES: (continued)

Many of the test patterns that are transmitted contain excessive zeros. If the network being tested at the 64 Kbps data rate does not have a zero substitution feature, these portions of the test data will cause network violations.

PROCEDURE

ACTION - Verify that a hard loop has been placed on the OCU Dataport card.

ACTION - Depress the "**Test Pattern**" Pushbutton on the Model 82 to select a Test Pattern.

RESPONSE - The Primary Channel and Secondary Channel (if optioned) Error Counters on the Model 82 LCD will lock. Reset the counter ("**Test Start/Stop**" twice)and it should read and hold "00".

ACTION - Errors may be inserted in either direction. Press the "**Scroll**" button to display the "INSERT 6 ERRORS" message on the bottom line of the LCD. Then press the "**SELECT**" Pushbutton to insert errors.

RESPONSE - The Model 82's Primary Channel Error Count Display will indicate "6" Bit errors, or typically "1" Block error (errored second).

2.3.4 END TO END, NETWORK

The Model 82 has the capability to accomplish Bit Error or Block Error (Errored Second) Cooperative Testing (Customer Premise to Customer Premise). These tests can be conducted on Secondary Channel optioned circuits or Primary Channel only circuits. These end-to-end tests require the use of two Model 82's. Both Straightaway and Manual Loopback type Testing can be conducted.

TYPICAL CIRCUIT

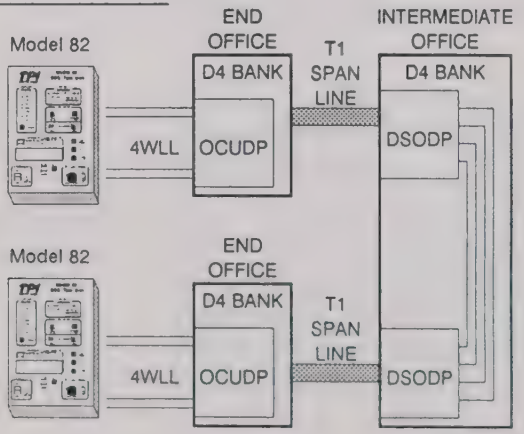


Figure 2-5

MODEL 82 SETUP

NOTES:

If the Model 82 is in the "READY/IDLE" mode, there is no test being conducted by the Model 82; it will respond to a Network Test Equipment initiated CSU or DSU Loopback Test in any mode.

The pattern Sensitive Sequences appliy to Primary Channel testing only. The Secondary Channel Error Count Display will show IDL when any of these test patterns is selected.

PROCEDURE

The Model 82 may be used in a cooperative manner with another Model 82 at another Customer Premise in a Straightaway Test, similar to the Section 2.3.2 procedure, except that Network Test Equipment is not involved. Counters should lock, be resetable, and hold "00" on both units.

In order to use the Model 82 in a Manual Loopback Test, the following steps would be followed:

ACTION - Press either the "CSU" or "DSU" Loopback pushbutton on one of the Model 82 units. (call it "Control")

RESPONSE - This will provide a loop toward the other Model 82 (call it "Test"), causing its "DSU" or "CSU" pushbutton to light and the Primary Channel Error Count Display (and Secondary Channel Error Counter if selected) to lock. Reset the counters ("**Test Start/Stop**"). Errors may be inserted from the "Test" Model 82 unit.

2.3.5 END TO END TESTING, FOUR WIRE DIGITAL LOOP

The DDS Test Unit also has the capability to accomplish Bit Error or Errored Second cooperative testing from one customer premise to another customer premise, without a network between the two customer premises. These tests can be conducted in a similar fashion to paragraph 2.3.4, also requiring the use of two units.

TYPICAL CIRCUIT

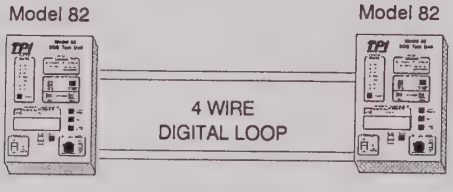


Figure 2-6

PROCEDURE

The Model 82 may be used in a cooperative manner with another Model 82 at another customer premise in a Straightaway Test similar to the paragraph 2.3.2 procedure. In this case, the **Test Pattern** can be set to either 511, 2047, or any of the pattern sensitive sequences on both units and the "**Scroll**" menu must be used to set the Local Clock to "ON" for the "Control" unit. The Error Counters will lock and errors may be inserted.

In order to use the Model 82 in a Manual Loopback Test, the **CSU** or **DSU Loopbacks** pushbutton must be pressed on one of the units. The other Model 82's Error Counters will lock and errors may be inserted.

2.4 TROUBLESHOOTING

PROBLEM	SOLUTION
Circuit tests bad	- Check the line for load coils.
"No Signal" LED is lit	- Indicates no signal on the line, or all 0's being received. Check the cord connections.
	- The network may be transmitting all 0's if there is nothing connected to the network side of the OCU. (If there is nothing connected to the OCU, the data that it will transmit on the local loop will vary with the OCU's manufacturer.)
"No Signal" LED is flashing	- Network is transmitting control codes; may also indicate that there is nothing connected to the network side of the OCU.

SECTION III

SWITCHED 56 SOFTWARE OPTION

3.1 GENERAL DESCRIPTION

A software option (TPI 82-56) may be ordered to enable the Model 82 to dial Switched 56 lines from a customer premise environment. When the software option has been installed, an additional menu selection will be available called "4-WIRE SW 56", which allows dialing functions to be accomplished in 4-wire switched 56 Kbps networks.

When optioned for SW-56 testing, the power up routine will display an "S" after the software rev. level.

3.2 OPERATION

When the Model 82 is equipped with the SW 56 software option (TPI 82-56), a switched 56 circuit can be dialed and accessed by entering the appropriate number.

Network access should be gained as indicated in setup paragraph 2.2.1. "Scroll" through the menu selections until "4-WIRE SW 56" appears. "Select" the "4-WIRE SW 56" menu and the following screen should result (after a momentary "ON HOOK" transition message):

```
SCROLL SELECTION
SELECT  = EXIT XX
```

Depressing the "Select" switch exits the "SWITCHED 56" menu. "XX" reflects the dB reading for the 4-wire local loop. "SCROLL SELECTION" means that the "SWITCHED 56" sub menus are available by using the Scroll" switch. The "Scroll" selections available are "DIAL" numbers "0" thru "9", and "EXIT".

To enter a number, use the scroll switch to obtain the number, then "Select" that number. The number selected will appear in the top line. Subsequent numbers may be selected in the same manner. Should an error be made, simply depress the "Scroll" switch downward to erase the last number selected.

When the correct number has been entered on the top line, use the "Scroll" key to gain the "SELECT = DIAL" menu on the bottom line. Dial the selected number by using the "Select" switch. The Model 82 will cause an "OFF HOOK" signal and wait for an acknowledgement ("WINK") from the switch for approximately 12 seconds. If the "WINK" is not received, a "NO WINK RECEIVED" message will appear on the top line. If the circuit is in the Data mode, a "TIMEOUT" message will be displayed on the top line when attempting to dial.

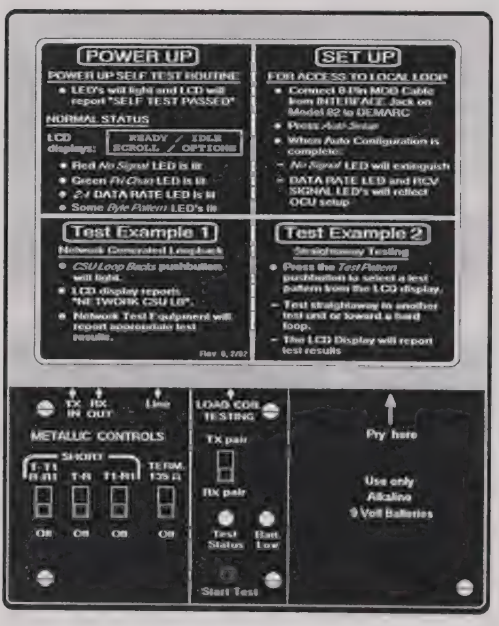
Once the "WINK" has been received, the menu will change from "OFF HOOK" to "DIALING". Once dialing is complete, the message "WAIT ANSWER" will appear on the screen until an "OFF HOOK" signal is detected from the other end of the network (If no answer is received within 12 seconds, a "NO ANSWER" message will be displayed). At that time, the screen will indicate "CONNECTED", and will change to the main "4-WIRE SW 56" menu shown below:

```
READY / IDLE
4-WIRE SW 56
```

The switched 56 line is now accessed and normal testing may be accomplished by any of the available test patterns.

SECTION IV

METALLIC TESTING OPTIONS

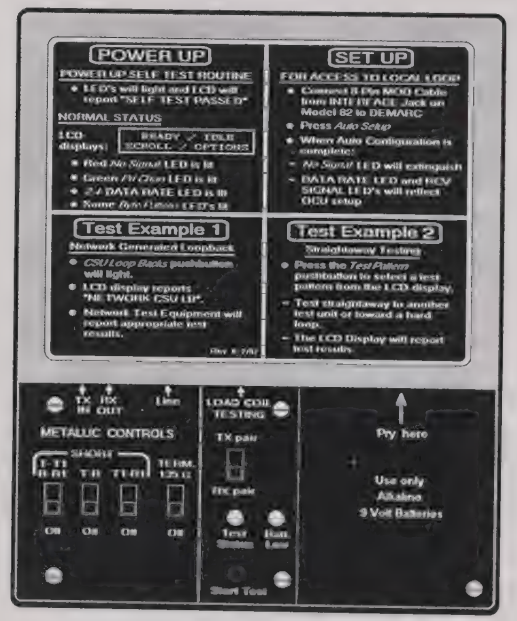

POWER UP
POWER UP SELF TEST ROUTINE
• LED's will light and LCD will report "SELF TEST PASSED"
NORMAL STATUS
LCD displays: READY / IDLE
SCROLL / OPTIONS
• Red No Signal LED is lit
• Green Rx Chan LED is lit
• 2.4 DATA RATE LED is lit
• Some Byte Pattern LED's lit
SET UP
FOR ACCESS TO LOCAL LOOP
• Connect 8 Pin MOD Cable from INTELLIGENCE Jack on Model 82 to DEMARC
• Press Auto Setup
• When Auto Configuration is complete:
– No Signal LED will extinguish
– DATA RATE LED and RCV SIGNAL LED's will reflect OCU setup
Test Example 1
Network Generated Loopback
• CSU Loop Back pushbutton will light.
• LCD display reports "NETWORK CSU LB".
• Network Test Equipment will report acceptable test results.
Test Example 2
Straightaway Testing
• Press the Test Pattern pushbutton to select a test pattern from the LCD display.
– Test straightaway to another test unit or toward a hard loop.
– The LCD Display will report test results
Rev. 0, 2/87
TX IN
RX OUT
Line
METALLIC CONTROLS
SHORT
T-TI RI-RI
T-R
TI-RI
TERM. 135 Ω
Off
Off
Off
Off
LOAD FOR TESTING
TX pair
RX pair
Test Status
Batt. Low
Start Test
Pry here
Use only Alkaline 9 Volt Batteries

Option 82-M/LC

4.1 GENERAL DESCRIPTION

Metallic Test Controls (TPI 82-M/LC) may be ordered to aid in metallic testing. When this option has been installed, the lid depth will increase by 5/8" and the weight will increase by 1/2 pound.

The TPI Model 82-M/LC, Metallic/Load Coil option (shown on the left), is used for metallic access, and to assist in metallic testing, including testing for load coils.

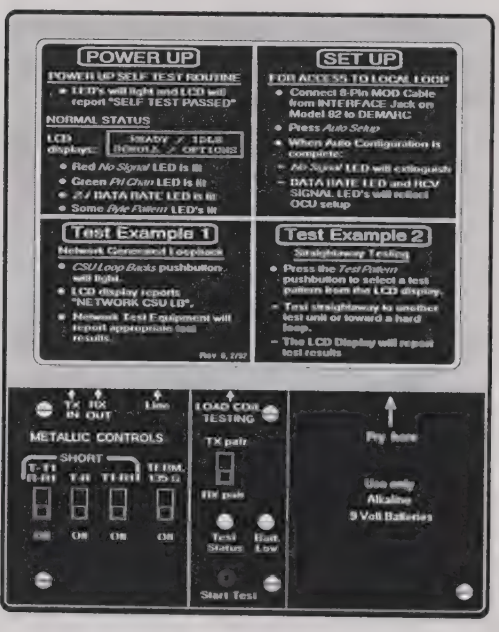

POWER UP
POWER UP SELF TEST ROUTINE
• LED's will light and LCD will report "SELF TEST PASSED"
NORMAL STATUS
LCD displays
READY ✓ TELE
ENROLL ✓ OPTIONS
• Red No Signal LED is lit
• Green Hi Gain LED is lit
• 2.4 DATA RATE LED is lit
• Some Byte Errors LED's lit
SET UP
FOR ACCESS TO LOCAL LOOP
• Connect 8 Pin MOD Cable from INTERFACE Jack on Model 82 to DEMARC
• Press Auto Setup
• When Auto Configuration is complete:
- No Signal LED will extinguish
- DATA RATE LED and RCV SIGNAL LED's will reflect DSU setup
Test Example 1
Network Generated Loopback
• CSU Loop Backs pushbutton will light.
• LCD display reports "NETWORK CSU LB".
• Network Test Equipment will report appropriate test results.
Test Example 2
Straightaway Testing
• Press the Test Pattern pushbutton to select a test pattern from the LCD display.
- Test Straightaway to another test unit or toward a hard loop.
- The LCD Display will report test results.
TX IN
RX OUT
Line
METALLIC CONTROLS
SHORT
T-TI R-RI
T-RI
TERM. 125 Ω
Off
LOAD COIL TESTING
TX pair
RX pair
Test Status
Batt. Low
Start Test
Pry here
Use only Alkaline 9 Volt Batteries

Option 82-M/LC

4.2 PHYSICAL DESCRIPTION

The TPI Model 82-M/LC Metallic/Load Coil (shown on the left), is a compact, easy to use unit that fits in the lid of the TPI Model 82 DDS Test Unit. It consists of the following Metallic connectors and controls:

- A 8-Pin modular jack for gaining metallic network access (Line).
- Two mini-bantam jacks that may be used for Transmit and Receive metallic access (TX IN, RX OUT).
- A slide switch used to place a 135Ω termination on the Transmit & Receive cable pairs (TERM. 135Ω).
- A slide switch used to short the cable pairs T1 to R1 (SHORT T1-R1).
- A slide switch used to short the cable pairs T to R (SHORT T-R).
- A slide switch used to short Transmit and Receive cable pairs, shorting T to T1 and R to R1 simultaneously (SHORT T-T1, R-R1).


POWER UP
POWER UP SELF TEST ROUTINE
• LED's will light and LCD will report "SELF TEST PASSED"
NORMAL STATUS
LCD displays:
READY // 1248
Remote // OPTIONS
• Red No Signal LED is lit
• Green Pri Chan LED is lit
• 2 / DATA RATE LED is lit
• Some Byte Pattern LED's lit
SET UP
FOR ACCESS TO LOCAL LOOP
• Connect 8-Pin MOD Cable from INTERFACE Jack on Model 82 to DEMARC
• Press Auto Setup
• When Auto Configuration is complete:
– No Signal LED will extinguish
– DATA RATE LED and HCV SIGNAL LED's will reflect OCU setup
Test Example 1
Network Generated Loopback
• CSU Loop Backs pushbutton will light.
• LCD display reports "NETWORK CSU LB".
• Network Test Equipment will report appropriate test results.
Test Example 2
Straightaway Testing
• Press the Test Pattern pushbutton to select a test pattern from the LCD display.
– Test straightaway to another test unit or toward a hard loop.
– The LCD Display will report test results
TX IN
RX OUT
Line
METALLIC CONTROLS
SHORT
T-TI R-RI
T-RI
T-TI
TERM. 135 Ω
Off
Off
Off
Off
LOAD CODE TESTING
TX pair
RX pair
Test Status
Batt. Low
Start Test
Pry here
Use only Alkaline 9 Volt Batteries

Option 82-M/LC

The TPI 82-M/LC has the following controls and connectors to provide load coil testing capability:

- An 8-Pin modular jack used for access when testing for load coils ("LOAD COIL TESTING").
- A slide switch used to select either the TX or RX pair to test for load coils ("TX pair", "RX pair").
- A multicolor LED to report Test Status ("Test Status").
- A pushbutton used to start a test ("Start Test").
- A red LED to indicate a battery low condition ("Batt. Low").

4.3 TESTING FOR LOAD COILS

To test either the transmit or receive pair of the DDS circuit for load coils, plug one end of the 8-Pin Modular cord (834005) into the jack marked "**Load Coil Testing**" on the TPI 82-M/LC. Plug the other end into the specific pairs' modular jack on the network interface. The pair is now set up to be tested for load coils.

Determine which pair to test for load coils by positioning the slide switch to "**TX pair**" or "**RX pair**". Press "**Start Test**" button to begin the test. The "**Test Status**" indicator LED will flash yellow-orange while the test is in progress. After a few seconds, the "**Test Status**" LED will change to a steady light of either green or red. If the "**Test Status**" LED is a steady green light, there are no load coils present on the line. If the "**Test Status**" LED is a steady red light, there is a high probability of load coils being present on the line. It is recommended that the test for load coils be done twice, with the same results each time, before further action is taken toward locating the load coils. The "**Load Coil Testing**" circuitry will turn itself off approximately ten (10) seconds after the test has been completed.

The red "**Batt. Low**" LED indicator will illuminate when the battery level is becoming too low for proper operation. There will be at least ten minutes (based on the use of a 9 Volt Alkaline battery) of operation left when this LED illuminates. When the "**Batt. Low**" LED illuminates, it is suggested that the 9 Volt Alkaline battery be replaced.

4.4 BATTERY REPLACEMENT

To replace the standard 9-Volt Alkaline battery, remove the screw in the right corner of the lid. Locate the area indicated by the arrow marked "**Pry here**". Lightly pry with your fingers or a small screwdriver towards you. The compartment door should easily pop out. Carefully remove the old battery from its position by moving it from the right to the left and then from the left to the right with your fingers. Insert the new battery in same place the old battery was just removed from; being careful to insure the polarity is correct. With the battery in the correct position for insertion, the Positive terminal of the battery should be on the right and the Negative terminal should be on the left. Carefully press the new battery into the terminals. Replace the compartment cover by positioning it so the "**Pry here**" arrow is pointing up and the cover is aligned with the side of the "**Load Coil Testing**" face plate and the side of the Model 82 lid. Then press until it is flush with the face plate and replace the screw in the corner.

4.5 TPI 82-M/LC SPECIFICATIONS

POWER

9V Battery

PHYSICAL

5 ¼" W x 2 ½" H x 1 1/6" D

½ lb.

INDEX

A

Access, 2-4, 3-2

Accessories, 1-44

Applications, 1-46 to 1-48, 2-7 to 2-24

B

Batteries

- Life, 1-50, 1-53
- Replacement, 1-50, 4-8

C

Cables, 1-44

Capabilities, 1-51

Channel Service Unit, 1-8

Compatibility, 1-51

Connections, 1-21

Controls, 1-22 to 1-42, 1-52, 4-3, 4-5

CSU (*see* Channel Service Unit)

Index

D

Data Rates, 1-23, 1-52

Data Service Unit, 1-7

Descriptions

- Functional, 1-46 to 1-48
- General, 1-1, 3-1, 4-1
- Physical, 1-20 to 1-21, 1-54, 4-3, 4-5

DSU (*see* Data Service Unit)

Digital Network, 1-2

Displays, 1-53

DS-1 (*see* Signals)

DS0B (*see* Signals)

E

End-to-End Testing, 2-20 to 2-24

External Connections (*see* Connections)

L

Load Coil Testing, 4-6 to 4-7

Local Loop, 1-4

Index

Loopback Testing, 2-7 to 2-9, 2-16 to 2-19

M

Maintenance, 1-49

Metallic Controls, 4-1 to 4-9

O

OCUDP, 1-16

OCU (*see* Office Channel Unit)

Office Channel Unit, 1-9

P

Pattern Sensitive Test Sequences, 2-5

Power, 1-53

Power Up, 2-1

R

Repeaters, 1-18

S

Secondary Channel, 1-11

Set-Up, 2-3 to 2-4

Index

Signals
- DS0B, 1-13
- DS-1, 1-15

Specifications, 1-51 to 1-54, 4-9

Straightaway Testing, 2-10 to 2-15

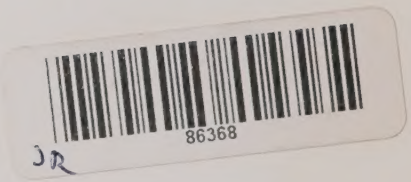
Switched 56, 3-1
- Operation, 3-2

T

Testing, 2-5
- End-to-End, 2-20 to 2-24
- Load Coil, 4-6 to 4-7
- Loopbacks, 2-7 to 2-9, 2-16 to 2-19
- Straightaway, 2-10 to 2-15

Test Patterns, 1-43

Troubleshooting, 2-25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